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A New Look *Danthonia*

Overviews and Recommendations for Future Research Priorities on Native Seed Dormancy and Germination

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Australasian Plant Conservation Editor

For this issue Dr David Merritt

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Front cover: A collection of fruits of various species from Western Australia. Seeds of these species have been collected by staff from Kings Park and Botanic Garden (BGPA) as part of the Millennium Seed Bank Project. Duplicate collections of seeds will be stored at Kings Park and the Millennium Seed Bank, Royal Botanic Gardens Kew.The MSB Project aims to collect and store 10% of the world's seed-bearing flora by 2010.

ANPC Inc. Mission Statement

"To promote and develop plant conservation in Australia"

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Australasian Plant Conservation is a forum for information exchange for all those involved in plant conservation: please use it to share your work with others. Articles, information snippets, details of new publications or research, and diary dates are welcome. The deadline for the June 2003 issue is the 10th May 2003.

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A New Look *Danthonia*

Welcome to the first edition of *Australasian Plant Conservation*, the newly re-named *Danthonia*. Due to recent taxonomic considerations and a desire to promote the activities of the ANPC to a wider national and international audience, it was passed at the last ANPC AGM to change the name of the ANPC's newsletter to *Australasian Plant Conservation*.

This special first edition of *Australasian Plant Conservation* is the venue for a major article recommending future directions in seed research in Australia, particularly in regards to developing new methods for breaking seed dormancy. These recommendations result from a study tour to Australia by Professors Carol and Jerry Baskin, of the University of Kentucky, world recognised experts in seed biology. The six week visit was sponsored by a Land and Water Australia Fellowship and Kings Park and Botanic Garden (BGPA). Part of the visit included a Seed Dormancy Master Workshop, held at the University of Western Australia in August 2002. The workshop brought together 30 delegates from across Australia, including researchers and representatives from landcare groups, seed industry and native plant propagators. The tutorials and practical demonstrations covered topics including describing seed and embryo morphology, evolution of seed dormancy, methods to identify seed dormancy type, and experimental approaches to dormancy alleviation.

The following article provides an overview of techniques, new experimental designs and proposals for new directions in seed testing, dormancy and storage research that address current issues in seed science for Australian plants. This new information comes at a time of increasing awareness of the need for greater diversity in bushland restoration and rehabilitation programs. Demands for the propagation of more species (particularly understorey species) and the improved efficiency of use of native seeds require new approaches to seed science in Australia. It is hoped this article may inspire more focussed research on native seeds and thus provide new opportunities for seed users in Australia. For further information contact Dr David Merritt, Kings Park and Botanic Garden Ph: (08) 9480 3639 Email: dmerritt@kpbg.wa.gov.au

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Overview and Recommendations for Future Research Priorities on Native Seed Dormancy and Germination of Australian Plants

Carol C. Baskin and Jerry M. Baskin

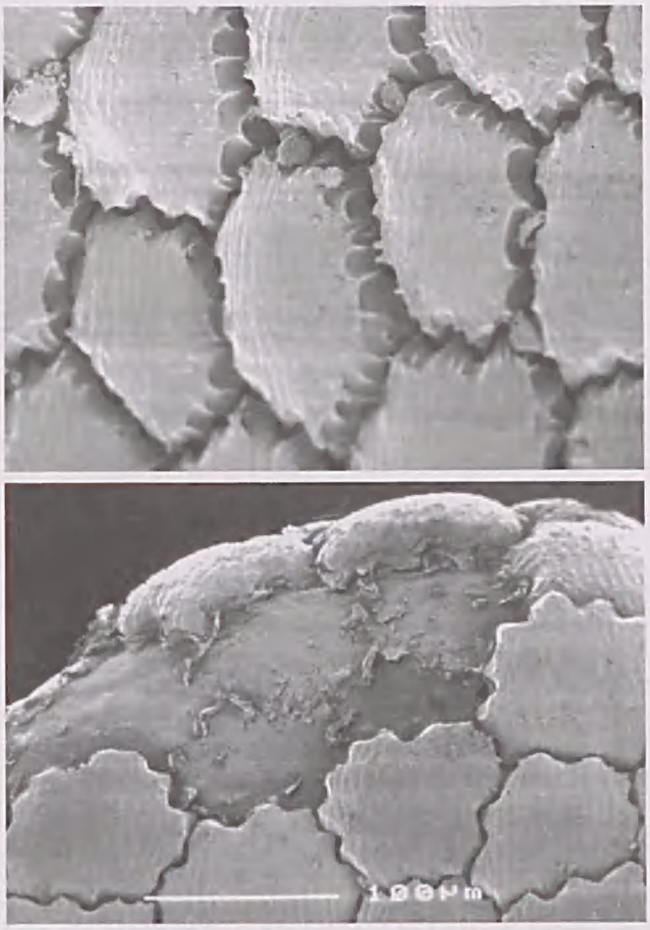
University of Kentucky in association with Kings Park and Botanic Garden (BPGA), Western Australia

Introduction

Seed dormancy is a major problem in restoration of natural vegetation on disturbed lands in Australia. Of the five kinds (classes) of seed dormancy recognized by Baskin and Baskin (1998), physiological (low growth potential of the embryo) and physical (water impermeable seed coat) most likely are the ones present in greatest abundance in Australian species. Further, physical dormancy can be easily broken by such treatments as dipping into boiling water for a few seconds or mechanical scarification. Thus, for the restoration ecologist most seed dormancy problems are with seeds that have physiological dormancy and to a much lesser extent with those that have morphological (small embryo that needs time to grow and germinate), morphophysiological (small embryo with physiological dormancy), and combinational (physical plus physiological) dormancy. Consequently, the primary focus of our recommendations is on breaking physiological dormancy. In particular, we focus on research efforts to promote dormancy break in difficult to germinate species, defining optimal conditions for germination of nondormant seeds, and how to organize a seed dormancy data base at the level of the plant genus. Further, recommendations are made concerning ways in which to get better results with such aspects of seed biology as viability testing and soil seed banks.

Acacia coriacea *is a typical legume with physically dormant seeds. The colour polymorphy may indicate varying levels of physical dormancy.*

A discussion by participants in a national seed workshop held in Perth, Western Australia, 5th to 6th August 2002 resulted in a list of 28 seed research needs. We have incorporated into our recommendations the items on the participants' list that we think are relevant to understanding how to break dormancy and germinate seeds of Australian species, especially those with physiological dormancy.



Electron micrographs of Loxocarya gigas *seeds. Compare the soil-aged seed (bottom) with the fresh seed (top). Freqeunt heating and wetting in the soil stresses the surface structure of the seeds. Soil aged seeds are often more responsive to germination cues. Research is continuing to artificially replicate the soil ageing process and germinate ex situ stored seeds.*
Photo: L. Egerton-Warburton

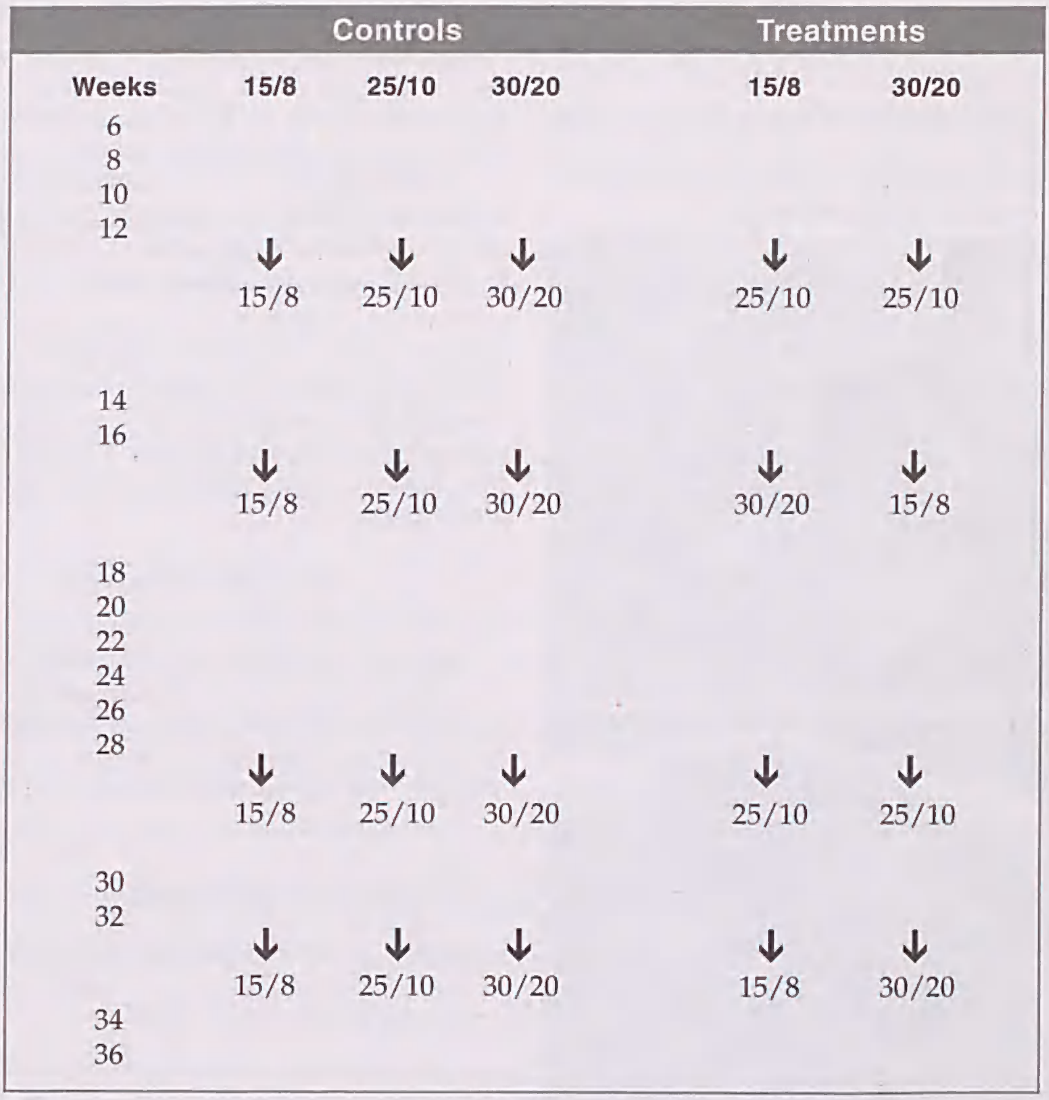
Seeds of most serotinous species, such as this Banksia, *have no dormancy once released from their protective fruits.*
Photo: K. Dixon

I. Dormancy Breaking Requirements

In depth studies on the dormancy breaking requirements need to be carried out, especially on the difficult-to-germinate species of the Cyperaceae, Dilleniaceae, Epacridaceae, and Restionaceae. Particular attention needs to be given to the roles of warm and/or cold stratification in breaking dormancy in seeds of these taxa. Warm and cold stratification have not previously been included in the dormancy breaking protocols for these groups of dominant understorey species in various plant community types in Australia. Use of the Baskin and Baskin 'move-along' experimental approach for seed dormancy research (Fig. 1) would allow one to determine if warm, cold, warm followed by cold, or cold followed by warm stratification treatment is required for dormancy break in the taxa being investigated.

Recommendations:

- Dormancy release studies need to rely on the use of fresh, fully ripened seeds. Many previous experiments with Australian seeds of native plants have used seeds stored for different lengths of time under various conditions, often without adequate record of the conditions under which the seed was stored. The investigator should be aware that seeds may change during dry storage, even at -18°C. The storage condition/time may confound experimental results and their interpretation. Researchers should consider storage length and storage conditions as possible confounders or 'treatments' in analysis of native seed research.
- Use at least three alternating temperatures regimes in the move-along experiment that represent temperatures during the key temperate Australian generative times of winter, spring/autumn, and summer (Fig. 1).
- Use a 12- to 14-hour daily photoperiod. Photon irradiance (400-700 nm) should be in the range of 20-100 mmol m^{-2} s^{-1}.
- The first time a species is tested, use a continuously moist substrate. Wet/dry or dry simulating summer conditions can be added later if needed.



	Controls			Treatments	
Weeks	15/8	25/10	30/20	15/8	30/20
6					
8					
10					
12					
	↓	↓	↓	↓	↓
	15/8	25/10	30/20	25/10	25/10
14					
16					
	↓	↓	↓	↓	↓
	15/8	25/10	30/20	30/20	15/8
18					
20					
22					
24					
26					
28					
	↓	↓	↓	↓	↓
	15/8	25/10	30/20	25/10	25/10
30					
32					
	↓	↓	↓	↓	↓
	15/8	25/10	30/20	15/8	30/20
34					
36					

Figure 1. Diagrammatic representation of the 'move-along' experimental concept, using 15/8°C for winter, 25/10°C for spring and for autumn, and 30/20°C for summer, which would be applicable to warm, mediterranean type or similar climates. Temperature data derived from maximum and minimum temperature averages for Perth. Seeds in the three controls are kept continuously at each respective temperature regime, while seeds in the treatments are moved after 12 or 4 weeks, as shown in the diagram.

II. Optimum Germination Conditions after Dormancy is Broken

After seed dormancy is broken, optimum conditions for germination and emergence with regard to temperature, light, and substrate moisture should be determined. For example, if seeds in the move-along experiment germinate after exposure to a cool (15/8°C) treatment, determine how much cool treatment actually is needed to break dormancy; it may be less than the 12 weeks of cool treatment given during the move-along experiment. Further, following a dormancy-breaking treatment the optimum temperature for germination may be higher (or lower) than the treatment temperature used to release the seeds from dormancy.

Recommendations:

- Place seeds on a moist substrate and incubate under either cool or warm conditions – based on results from the move-along experiment.
- At 2-week intervals, remove some seeds (i.e., three replications of 50 seeds each), and test them for germination at three or more temperature regimes.
- To learn about the light:dark requirements for dormancy break and germination, seeds can be warm- (or cold-) treated in darkness and subsequently tested in both light and darkness. At the same time, seeds warm- (or cold-) treated in light can be tested in both light and darkness.

- To reduce the number of seeds required for the light:dark study, seeds can be exposed to treatment/testing combinations of: dark (during stratification) → dark (during testing), dark → light, light → light, and light → dark after 12 weeks (only) of exposure to the treatment temperature.

III. Dormancy Classification of Australian Genera

In general, seeds of species in the same genus may have the same dormancy-breaking requirements, particularly if seed morphology and anatomical structures appear similar. Therefore, it would be of great benefit in seed dormancy release studies if the class of dormancy was known (or suspected) to occur in other members of the genus. Such a body of information could be used by people working on seeds throughout Australia. Use of the Baskin and Baskin (in press) key to the classes of dormancy (Table 1) would allow the investigator to use basic information about seeds to determine the class of dormancy in genera that have not been previously studied.

Recommendations:

- Develop a database at the generic level (based on similarities in seed morphology and structure) on classes of dormancy in seeds of Australian plants.
- Database should include information on type of embryo (underdeveloped or fully developed), embryo morphology, and relationship between embryo size and endosperm size. [See sketches of embryos from various Australian species (Appendix 1), representing all the known types of embryos, except broad, e.g., embryo type in *Juncus*, and micro, e.g., embryo type in Orchidaceae].
- Permeability of seeds to water needs to be evaluated closely and may require detailed analysis of imbibition profiles over time and maybe in conjunction with water permeability dyes to track water movement pathways.

IV. Soil Seed Banks and Dormancy Cycling

Soil seed banks are an important source of seeds for restoration of plant communities and in reclamation of disturbed lands. Seed banks can be classified as transient (seeds live for less than 1 year) or persistant (seeds live until at least to the second germination season). However, just because seeds are present in the soil does not mean that they will germinate, even if they are viable and in seemingly appropriate temperature, moisture and light conditions.

Lack of germination at a particular time of the year may be due to the fact that seeds are dormant. That is, the seeds may be nondormant and germinate at some times of the year and be dormant and not germinate at other times. Many seeds buried in the soil cycle between dormancy and nondormancy (Baskin and Baskin, 1998). However, little is known about dormancy cycling in buried seeds (and indeed seeds stored under *ex situ* conditions) in Australia. (In Australia, it has been studied most extensively in the weed *Arctotheca calendula*, a native of southern Africa). Such information would allow groups involved in land restoration programs to predict which species present in the soil seed bank should germinate in soil at given times throughout the year.

Dissected seed of Dianella revoluta *showing the linear embryo embedded within the endosperm.*

Recommendations:

- Fresh seeds with permeable seed coats should be placed in polyester or similarly inert but biologically resistant mesh bags and buried in soil under natural temperature and watering regimes.
- Seeds should be exhumed and tested at monthly intervals throughout the year.
- Exhumed seeds should be tested over a range of alternating temperature regimes simulating those in the habitat throughout the year (at least three regimes) and in both light and darkness. If seeds are dormant, they will not germinate at any condition, if nondormant they will germinate over a wide range of conditions, and if conditionally dormant they will germinate over only a limited range of conditions.

V. Role and Use of Smoke

Although smoke has been shown to be very effective in promoting seed germination of many geosporous species, it does not achieve germination for all species, which though they germinate in response to smoke in nature fail to respond under *ex situ* conditions. Futher, there may be a dormancy breaking requirement (e.g., afterripening of seeds in dry storage) before seeds of some species respond to smoke. Research efforts need to be devoted to determining if smoke breaks dormancy and/or promotes germination. Elucidating the difference between these actions is crucial to ensuring that dormancy research operates in a sequence which reflects the natural cycles within the soil seed bank.

Table 1. Key for dormancy classes (Baskin and Baskin, in press).

1. Seed/fruit coat not permeable to water, embryo fully developed............ 2
    2. Germination occurs within about 2 weeks (usually within a few days) when seed/ fruit coat is scarified ..... **PHYSICAL DORMANCY**
    2. Germination does not occur within about 2 weeks (usually not even within a somewhat longer period of time) after seeds/fruit coat is scarified, although seed becomes fully imbibed within a few hours following scarification................. **COMBINATION OF PHYSICAL AND PHYSIOLOGICAL DORMANCY**
1. Seed/fruit coat permeable to water; embryo either fully developed or underdeveloped 3
    3. Embryo not differentiated, or if differentiated it is underdeveloped (small) 4
        4. Embryo not differentiated ....**SPECIALIZED TYPE OF MORPHOLOGICAL DORMANCY**
        4. Embryo differentiated but underdeveloped (small) 5
            5. Embryos in freshly-matured seeds begin to grow (elongate) within a period of a few days to 1-2 weeks, and seeds germinate within about 30 days .... **MORPHOLOGICAL DORMANCY**
            5. Embryos in freshly-matured seeds do not begin to grow within a period of even a few weeks, and seeds do not germinate within 30 days .... **MORPHOPHYSIOLOGICAL DORMANCY**
    3. Embryo differentiated and fully developed (elongated).............. 6
        6. Seeds do not germinate within about 30 days .... **PHYSIOLOGICAL DORMANCY**
        6. Seeds germinate within about 30 days .... **NONDORMANT**

Recommendations:

- For species known to respond to smoke, test freshly matured seeds and those afterripened for extended periods of time.
- Determine if there is a correlation between class of dormancy (see above) and response to smoke.
- Determine if seeds with underdeveloped embryos respond to smoke prior to the time that embryo elongation is complete, or if the response to smoke is delayed until embryo growth is completed.
- Determine the effect of embryo type (i.e., fully developed vs. underdeveloped, see Appendix 1) on time to emergence of smoke-treated (and control!) seeds.
- Determine if seeds buried in the soil undergo annual cycles in their ability to respond to smoke.

Drosera erythrorhiza, *an example of a species with a smoke requirement for germination.*

VI. Seed Storage After Dormancy is Broken

It is highly desirable for reclamation efforts to be able to store seeds after dormancy has been broken. That is, after dormancy is broken (priming or pre-germination treatments), can the seeds be stored without loss of viability and without them re-entering (secondary) dormancy?

Recommendations:

- Initiate studes on survival of dormant vs. nondormant seeds under various storage conditions and following application of various priming treatments.
- Determine the conditions required for storage of nondormant seeds.
- Determine if nondormant seeds re-enter dormancy during storage, and find ways to prevent this from happening.
- Determine if dormant seeds slowly come out of dormancy during optimised dry storage at -18°C or at -196°C. If seeds do not come out of dormancy during dry storage at low temperatures, and the seeds do not exhibit obvious external signs of structural change (e.g., such as fissuring of seed walls or testas), then seeds of the species can be collected and stored until they are needed for basic studies on dormancy.

VII. Viability Testing

It is important to know the percentage viability of the seed lot(s) with which one is working. Basing germination percentage on the absolute number of seeds will be misleading if there is a high percentage of nonviable seeds in seed lots being tested. For example, if only 10% of the seeds sown is viable and all of these germinate one may erroneously conclude that 90% of the seeds are dormant. We suggest that germination percentages be based on number of viable seeds (use of the concept of 'viability adjusted germination') since these are the only ones that could possibly germinate. From the seed users point of view, knowing the number of viable seeds is essential for calculating the number of seeds to be ordered or sown to achieve a germination outcome.

Kingia australis, *an example of a species with inherently low seed viability.*

Recommendations:

- Viability should be based on appearance of embryo in imbibed seeds. We have found that a white embryo (same color as endosperm) indicates viability, whereas a grey or yellowish embryo (slightly darker color than endosperm) indicates nonviability. White embryos usually, but not always, give a positive tetrazolium response, while yellowish or discoloured embryos do not.
- If one is not satisfied with results from appearance and reponse of embryos to tetrazolium, embryos should be excised and placed on moist filter paper to determine if they will exhibit growth and/or turn green. Fully developed viable embryos from seeds with nondeep physiological dormancy (the most common type of physiological dormancy) and those with physical dormancy, frequently will turn green, and radicles may start to grow if excised and placed on moist filter paper.

VIII. Other Recommendations

In our opinion, studies on chemical dormancy (inhibitors) in covering layers of the embryo and seed and breakage of dormancy via passage of seeds through digestive systems of animals (endozoochory) should be given low research priority until physiological dormacy is well understood for Australian species with 'deep' dormancy. Studies by the authors (Baskin and Baskin, 1998) indicate that there is a surprising dearth of information which unequivocally establishes a role for chemical based dormancy in seed or indeed that endozoochory is a phenomenon that leads to dormancy release as a regular agent in the natural recruitment biology of native seeds.

Further, the role of arils and associated structures providing ecologically meaningful germination outcomes linked to faunal activity (that is, results in germination events linked to dispersal events that would otherwise not occur without the agency of a faunal agent) requires investigation in Australian native geosporous species.

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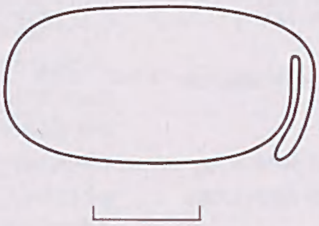
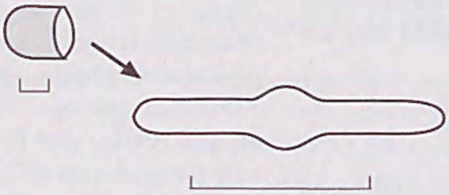
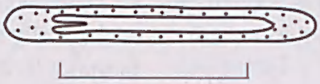
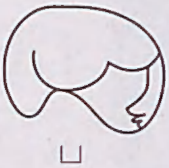
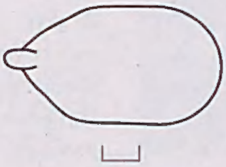
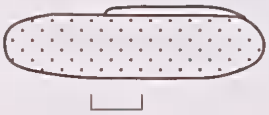
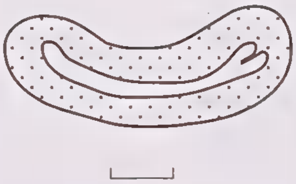
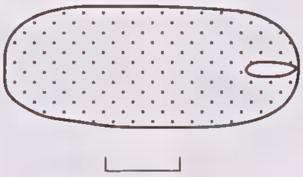
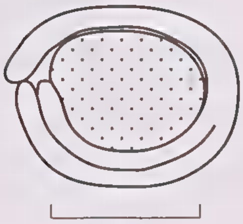
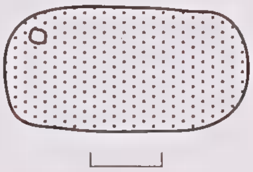
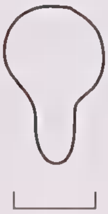
Martin, A.C. (1946). The comparative internal morphology of seeds. *Amer. Midl. Nat.* **36**: 513-660.

Appendix 1.

Sketches of embryos from seeds of various Australia taxa. One representative of each embryo type has been chosen from the Australian flora to show embryo morphology in 10 of the 12 known types of seeds (sensu Martin, 1946). Broad and micro seeds are not represented in these drawings, but they occur in the Juncaceae and Orchidaceae, respectively. Bar = 1 mm; clear area = embryo; dotted area = endosperm

Type of Seed	Embryo	Species (Family)
Bent		Gompholobium tomentosum (Fabaceae)
Broad		
Capitate		Mesomelaena tetragona (Cyperaceae)
Dwarf		Lysinema ciliatum (Epacridaceae)
Folded		Adansonia gregorii (Bombaceae)
Investing		Grevillea polybotrys (Proteaceae)

Type of Seed	Embryo	Species (Family)
Lateral		Themeda triandra (Poaceae)
Linear-full		Geleznowia verrucosa (Rutaceae)
Linear-underdeveloped		Lomandra nigricans (Lomandraceae)
Micro		
Peripheral		Enchylaena tomentosa (Chenpodiaceae)
Rudimentary		Hibertia lasiopus (Dilleniaceae)
Spatulate		Velleia rosea (Goodeniaceae)

ANPC Landscape Rehabilitation: Approaches and Techniques Training Course Reviews

ANPC Workshop 4th - 6th February 2003, Yass NSW

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I recently attended a workshop organised by the Australian Network for Plant Conservation titled "Landscape Rehabilitation: Approaches and Techniques". In my current employment as a Project Officer (Horticulture) at Sydney Olympic Park I am dealing with landscape rehabilitation on a large scale, and hoped to gain some knowledge about the latest rehabilitation practices and their possible application within the parklands.

The workshop was very well organised and the caliber of speakers excellent. The practical knowledge that the speakers possessed was what distinguished this workshop from other courses I had undertaken in the past. Instead of simply providing a generalised overview of the structure of rehabilitation projects, the speakers were able to back the discussion up with real life examples that I felt greatly increased my learning.

I was particularly impressed with Stuart Johnston, the Transgrid representative who led an open discussion about the highly publicised (and criticised) electricity easement clearing in Kosciuszko National Park. The rehabilitation of the affected areas and the changed attitudes and environmental training within the organisation, made this case study particularly interesting. It was a pity we were unable to visit the Transgrid rehabilitation sites due to the bushfires.

I found all the talks very thought provoking. Maurizio Rossetto presented "Choosing what to put back" a talk on genetic diversity and provenance, I found this speaker in particular added a whole new dimension to my understanding of rehabilitation.

Overall I had a really enjoyable experience. The workshop not only provided me with an educational experience, but a very pleasant social experience. The dinner on the second night was a great way for everyone to get to know each other and have some good food and wine! Jeanette and Laura did a fantastic job of organising the workshop and I have no hesitation in recommending Australian Network for Plant Conservation workshops to others.

Keep up the good work!

Emilie-Jane Ens
PhD Candidate
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There is general agreement regarding the direction of biological, ecological and landscape conservation from the local to international scale, and on the need to bridge the gap between contemporary research and *in-situ* management efforts. Such integrated approaches promote best use of minimal resources devoted or allocated to fulfill such aims.

Workshops and conferences which include a range of stakeholders involved in conservation are a fabulous way of increasing the flow of communication between science and land management which are otherwise often spatially, temporally and intellectually separated. The ANPC is therefore playing a vital role in initiating and maintaining such multilateral involvement in what is ultimately a life saving project.

From my perspective as an enthusiastic ecological research student and a keen bush regenerator, the cutting edge information and demonstration of cooperation provided by the ANPC, Transgrid, NPWS, the NSW Government Environmental Trust and the course speakers and attendees created an invaluable experience. The broad range of presentations delivered many important messages and successfully crossed interdisciplinary boundaries from genetics to project management. The range of topics and speakers encouraged broader thinking of attendees who may have previously been focused on certain domains of landscape rehabilitation, such as erosion problems or preservation of local plant communities. As environmental processes are intricately linked, it seems appropriate to encourage awareness and consideration of the many cycles, processes and interactions inherent in our quest to rehabilitate landscapes.

As a budding bush regenerator, I felt that two prominent points were discussed by Dr Ian Lunt and Dr Maurizio Rossetto concerning monitoring and genetic stock, respectively. Ian focused on the need for more monitoring and evaluation of rehabilitation works. In my limited experience to date, I have seen these actions neglected or overlooked often due to inadequate resources. However, as Ian pointed out, small note-taking efforts, photos and sketches can amazingly contribute to our understanding of landscape dynamics and the success of various rehabilitation methods. Maurizio (and Dr Tricia Hogbin) highlighted that the success of maintaining plant populations and communities also relies heavily on the genetic characteristics of species. He demonstrated that the reproductive strategies of various plants must be understood prior to any rehabilitation efforts. Of course this is almost impossible due to the paucity of research in this field. However, discussion of this issue was most interesting to the course participants.

The course structure also included some valuable practical explorations of landscape rehabilitation. Rainer Rehwinkel took us on a very interesting field trip to some significant conservation areas in the Yass region including Nanima Traveling Stock Reserve and Gundaroo Common. A supervised workshop on the formulation of a rehabilitation plan also provided working knowledge of some of the themes discussed throughout the course.

Thankyou to Jeanette Mill and Laura Vallee for providing a tremendously successful and educational experience and for their great organizational skills and promotion of plant conservation. I whole heartedly recommend attending similar courses run by the ANPC to anyone involved in natural area conservation.

David Tongway, CSIRO Sustainable Ecosystems, demonstrating Landscape Function Analysis on a Travelling Stock Reserve. Photo: Jeanette Mill, ANPC

Carl Vincent, Department of Land and Water Conservation, discussing rehabilitation at a revegetated roadside. Photo: Jeanette Mill, ANPC

Research Roundup

With, K.A. 2002. **The landscape ecology of invasive spread.** *Conservation Biology.* 16(5):1192-1203.

Naeem, S. 2002. **Biodiversity equals instability?** *Nature.* 416(6876): 23-24.

Jones, T.H. & Bradford, M.A. 2001. **Assessing the functional implications of soil biodiversity in ecosystems.** *Ecological Research.* 16(5): 845-858.

Nee, S. 2002. **Biodiversity: Thinking big in ecology.** *Nature.* 6886: 229

Tockner, K & Ward, J.V. 2002. **Biodiversity along riparian corridors.** *Proceedings- International Association of Theoretical and Applied Limnology.* 27(7): 3981.

Achard, F., et al. 2002. **Determination of Deforestation Rates of the World's Humid Tropical Forests.** *Science.* 297: 999-1002.

Rolstad, J., et al.. 2002. **Use of indicator species to assess forest continuity: a critique.** *Conservation Biology.* 16(1): 253-257.

Daugherty, C.H.; Allendorf, F.W. 2002. **The numbers that really matter.** *Conservation Biology.* 16(2): 283-284.

Lesica, P. & Hanna, D. 2002. **Monitoring composition of foothills grassland using frequency of indicator species.** *Natural Area Journal.* 22(2): 148-153.

Conferences & Workshops, Courses & Fieldwork

150 Years

29th September - 3rd October 2003,
The University of Melbourne

A joint conference of the
AUSTRALIAN SYSTEMATIC BOTANY SOCIETY
and
AUSTRALASIAN MYCOLOGICAL SOCIETY
with the
7TH BRYOLOGICAL WORKSHOP
and
ORCHID CONSERVATION FORUM II.

This conference celebrates the sesquicentenary of the National Herbarium of Victoria and systematic botany in Australia.

The conference will include:

- Sessions on Legumes, Myrtaceae, Mycology, Lichens, Bryophytes, Orchid conservation etc
- Australian Virtual Herbarium workshop/forum: uses and progress (HISCOM).
- the Australian Systematic Botany Society AGM
- the Australasian Mycological Society AGM

Associated events of the conference will include:

- Orchid Conservation Forum II (25-27 Sept. 2003). For details contact: Rob.Cross@rbg.vic.gov.au
- 7th Australasian Bryophyte Workshop (4-9 Oct. 2003). For details contact: Pina.Milne@rbg.vic.gov.au or Niels.Klazenga@rbg.vic.gov.au
- Book launch of Novelty to Rarity - a History of the National Herbarium of Victoria written by H. Cohn
- Botanical Art exhibition highlighting the State Botanical Collection of the National Herbarium of Victoria.
- Bryophyte Illustration Exhibition

Keynote addresses and other presentations:

150 Years Conference keynote opening address:
Professor P.F. Stevens (Botany, University of Missouri, and Curator, Missouri Botanical Gardens, USA.)

Tile: 'Higher-level names: What is it about them that make us fight so much?'

Myrtaceae mini-symposium keynote address:
Professor Pauline Y. Ladiges FAA (School of Botany, The University of Melbourne)

Title: 'Australian biogeographic connections and phylogeny of myrtaceous groups'

Nancy Burbidge Memorial Lecture:
Professor Robert S. Hill (ARC Professorial Research Fellow, University of Adelaide, and Head of Science, South Australian Museum)

Title: 'Fire, air, water and earth: elemental evolution of the Australian flora'

Keynote address:
Professor Brent D. Mishler (Department of Integrative Biology, Director, University and Jepson Herbaria, Associate Director, California Biodiversity Centre, University of California, USA.)

Title: 'Phylogeny of the land plants, with special reference to bryophytes'

For further information and brochures please contact:
Conference Management
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www.conferences.unimelb.edu.au/150years
ph: +61 3 8344 6389
fax: +61 3 8344 6122
email: bhewitt@unimelb.edu.au

Respecting Values – Working and Learning Together

28th April - 1st May 2003, Darwin

The 2003 National Landcare Conference will provide an important opportunity for information sharing, discussion and debate on the wide range of landcare issues facing us today in our ever changing social, environmental and economic climate.

The overall conference themes are:

- Emerging natural resource management issues: opportunities and solutions
- Building capacity and working with diverse cultures
- Social and economic aspects of natural resource management
- Managing land remote from urban centres
- International Landacre

For further information and brochures see
www.landcareconference.nt.gov.au

Greening the City:

Bringing Biodiversity Back into the Urban Environment

22nd -24th October 2003,
Christchurch, New Zealand

Conference of the Royal NZ Institute of Horticulture (in association with the Christchurch City Council, Environment Canterbury, Landcare Research and Pyne Gould Guiness). Held at Chateau on the Park, Christchurch.

The important role of cities as a repository for biodiversity is increasingly recognised within New Zealand and overseas, along with the need to focus on sustainable development, triple bottom-line accounting, and the function of green environments in maintaining community health and cohesion. In New Zealand, recent reports by the Parliamentary Commission for the Environment and the Ministry of the Environment have drawn attention to these issues. The conference will be based on these and other themes, with an emphasis on practical outcomes.

The conference will be held in the Garden City of Christchurch, where there is much collective expertise on urban biodiversity. Complementing our local experts will be several world authorities on the Greening of Cities, Landscape Architecture, and Town Planning to act as keynote speakers.

These topics are very timely as the Christchurch City Council puts into place its Biodiversity Strategies.

Keynote speakers include:

Dr Morgan Williams, Parliamentary Commissioner for the Environment, Wellington, New Zealand.

Professor Chris Bains, one of the UK's leading environmental campaigners, and an award-winning author and broadcaster.

Mason Tan, Landscape Architect and Director of Mace Studio, Singapore.

Dr Mark MacDonnell, Director of ARCUE, Melbourne, Australia.

Who will attend?

- Local and Regional Councillors
- Town Planners
- Landscape and Building Architects
- Horticulturists
- Educationalists
- Researchers
- Conservation Groups
- Others interested in Urban Biodiversity

For more information see
www.rnzih.org.nz/pages/conference2003.htm
or contact d&amoyle@xtra.co.nz

Revision of the ANPC Translocation Guidelines is up and running:

A workshop, which provided conference participants with the opportunity to provide input into the content and structure of the revised Translocation Guidelines, was held at the ANPC conference in Geelong in late February. Many valuable suggestions were made regarding additions to the revised edition, including; a section on designing translocation programs in an experimental way; additional detail on the need to consider the long-term suitability of the recipient site; and a section on how to evaluate translocation success.

The working group responsible for revising the Guidelines met the following morning to incorporate the workshop recommendations into a draft outline. The structure of the revised edition will be similar to that of the first edition, ie with sections on: pre-translocation assessment and preparation, the translocation itself, post-translocation actions, and community participation. There will however be an additional section on deciding whether to translocate. All the case studies are to be revised and we are looking for contributions from members. Have you been involved in a translocation program involving threatened plant species? Do you know of any translocation programs that have occurred? If so we would appreciate a 1 page summary and an indication as to whether a photograph suitable for publication is available. Please email or post any contributions to the ANPC National Office. (Contact details listed in the front pages).

Guidelines for the Translocation of Threatened Plants in Australia

Tricia Hogbin
Senior Threatened Species Officer
Central Directorate
NSW National Parks and Wildlife Service
PO Box 1967, Hurstville NSW 2220
Ph: 02 95856911, Fax: 02 95856442

And Finally ...

Persoonia mollis subsp maxima monitoring

APRIL 2003

As part of the implementation of the approved *Persoonia mollis subsp maxima* Recovery Plan the NPWS will be conducting its annual monitoring program across 5 sites within the Berowra, Calna and Cockle Creek Catchment areas.

So we are looking for volunteers who are keen to get off the beaten track, scramble down some gullies and fight off the leeches and ticks all in pursuit of a glimpse of this rare *Persoonia*. It takes a special breed of a person with an adventurous spirit.

So if you think this suits you, here are a few dates and locations

Wed 16th April Calna Creek
Flinders Place, Mt Colah

Tues 22nd April Calna Creek
Lyrebird Gully, Mt Ku-ring-gai
(seedling monitoring)

Wed 23rd April Calna Creek
Binya Cl, Hornsby Heights (site under threat)

Mon 28th April Cockle Creek
Gibberagong Waterholes

Tue 29th April Berowra Creek
Galston Creek site, Galston Gorge

For more information contact:
Meagan Ewings on 9585 6827 or
meagan.ewings@npws.nsw.gov.au

ANPC Membership List

Please note: the date in brackets indicates the calendar year that the member has joined or renewed for (January - December). Addresses and names of contact persons are available from the National Office.

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Wellington Plant Conservation Network, (2002)

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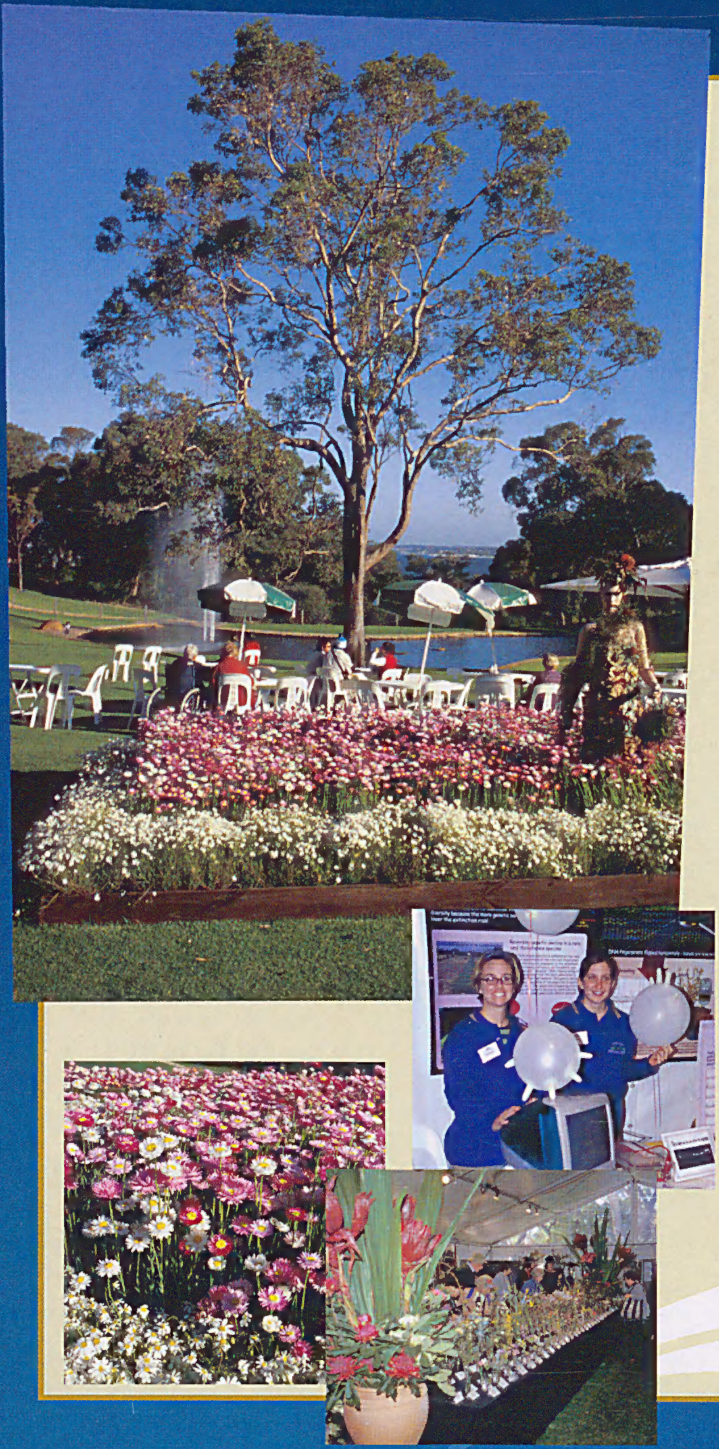
WMC Olympic Dam Operations, SA

KINGS PARK
Wildflower Festival 2003



The **Kings Park Wildflower Festival** is celebrating its 40th Birthday this year and to celebrate, the displays of propagated wildflowers will be bigger and better than ever. For those wanting to know more about how to grow and restore native species, the Festival is the place to be, with expert displays on bushland restoration techniques including how to use smoke for germination, weed control and how DNA fingerprinting can help you to better select native species for restoration.

Dates: **25 - 29 September 2003**
Cost: **$6.00 adult, $4.50 concession, $2 child**
Times: **9am-5pm daily**
Location: **Botanic Garden, Kings Park**
Fraser Ave, West Perth, Western Australia

Activities include:
Floral displays throughout, including many theme gardens,
Carpets of pink everlastings planted throughout the Mulga beds in the Garden for people to wander through and enjoy,
A guest speakers program,
Stunning floral designs by WA's leading floral designers,
The ever popular floral named specimen display to assist wildflower enthusiasts to identify WA wildflowers.
A music and entertainment program with the Botanic Water Garden and views over the Swan River as the backdrop.
Fresh wildflowers for sale,
A plant science display,
Botanic art by WA Botanic Artists Group,
Free guided wildflower bushwalks,
Native plant sales,
Tram tours of Kings Park,
Festival Gift Shop specialising in exclusive Kings Park and Botanic Garden products.

For more information contact our website:
www.bgpa.wa.gov.au

Australasian Plant Conservation
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